

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 11 April 2001 (11.04.01)	
International application No. PCT/GB00/03004	Applicant's or agent's file reference P57795D
International filing date (day/month/year) 03 August 2000 (03.08.00)	Priority date (day/month/year) 10 August 1999 (10.08.99)
Applicant ALLEN, John et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 27 December 2000 (27.12.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

S. Mafla

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P57795D	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 03004	International filing date (day/month/year) 03/08/2000	(Earliest) Priority Date (day/month/year) 10/08/1999
Applicant ELEKTA AB (publ) et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

4
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03004

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H05H7/18 H05H9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 H05H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, INSPEC, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	TANABE E ET AL: "Compact multi-energy electron linear accelerators" NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH, SECTION - B: BEAM INTERACTIONS WITH MATERIALS AND ATOMS, NL, NORTH-HOLLAND PUBLISHING COMPANY. AMSTERDAM, vol. B10/11, no. PART 02, 1985, pages 871-876, XP002103628 ISSN: 0168-583X page 873, left-hand column, paragraph 2	1-5,7
P, Y	GB 2 334 139 A (ELEKTA AB) 11 August 1999 (1999-08-11) the whole document --- -/--	1-5,7



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

* & * document member of the same patent family

Date of the actual completion of the international search

21 November 2000

Date of mailing of the international search report

27/11/2000

Name and mailing address of the ISA

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Authorized officer

Capostagno, E

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03004

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A°	<p>JAFFRAY D A ET AL: "Dual-beam imaging for online verification of radiotherapy field placement"</p> <p>WORKSHOP ON THE IMPLEMENTATION OF THREE DIMENSIONAL CONFORMAL RADIOTHERAPY, BETHESDA, MD, USA, 21-22 APRIL 1994, vol. 33, no. 5, pages 1273-1280, XP000964941</p> <p>International Journal of Radiation Oncology Biology Physics, 1 Dec. 1995, Elsevier, UK</p> <p>ISSN: 0360-3016</p> <p>abstract</p> <p>-----</p>	6

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2334139 A	11-08-1999	WO 9940759 A	12-08-1999

REC'D 31 DEC 2001

WIPO

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

12

Applicant's or agent's file reference ...	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/03004	International filing date (day/month/year) 03/08/2000	Priority date (day/month/year) 10/08/1999
International Patent Classification (IPC) or national classification and IPC H05H7/18		
Applicant ELEKTA AB (publ) et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 27/12/2000	Date of completion of this report 27.12.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van den Berg, G Telephone No. +49 89 2399 2499



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03004

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-10 as received on 30/10/2001 with letter of 30/10/2001

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03004

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 10.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Yes: Claims 1 - 9

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03004

	No:	Claims	
Inventive step (IS)	Yes:	Claims	1 - 9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1 - 9
	No:	Claims	

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/03004

To point III:

Please see comments under point VIII

To point VI:

The claimed priority of the underlying international application is valid. Documents GB 2 334 139 and WO 99 40759 have not been taken into consideration for assessment of novelty and inventive step.

To point VIII:

The claims do not meet the requirements of Article 6 PCT:

1. The description mentions a variable ratio of coupling coefficients in certain areas (cf. page 7, last line - page 8, line 1; page 8, lines 14 - 17). However, apart from that the at least one coupling cell is defined as being "switchable" between a (single) positive ratio and a (single) negative ratio (cf. page 3, lines 2 - 7; page 4, lines 5 - 15; 1st and 2nd full paragraph) which may cause a discrepancy with respect to the wording claimed in claims 1, 5 and 7 including **plural** positive and negative ratios.
Furthermore, from the description it does not become how many coupling cells are involved providing a positive and a negative ratio (cf. page 9, lines 4 - 8: "coupling cells"), or if it is the **same** cavity providing a positive and a negative ratio as probably required by claim 1.

The observations under point V are made under the reservation of these possible discrepancies between claims and description.
2. The requirement of Rule 6.2(a) PCT is not met (claim 10).
3. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

To point V:

Reference is made to the following documents:

Nuclear Instruments & Methods in Physics Research, Section - B: Beam Interactions with Materials and Atoms., vol. B10/11, no. Part 02, 1985, pages 871 - 876 (D1)

Workshop on the Implementation of Three-dimensional Conformal Radiotherapy, Bethesda, MD, USA, 21 - 22 April 1994, vol. 033, no. 5, pages 1273 - 1280 (D3)

1. (Novelty)

Insofar as the subject-matter of claim 1 can be understood in view of point VIII.1, it is not anticipated by the disclosure of D1 because the coupling cell provides a plurality of ratio values. The subject-matter of claim 1 and thus that of claims 5 and 7 would meet the requirement of Article 33(2) PCT.

2. (Inventive step)

Insofar as claim 1 can be understood in view of point VIII.1, it is not rendered obvious by the disclosure of D1 because according to this document the coupling cell can only provide one single negative value such that there would be no incentive to continuously vary the ratio obtaining a plurality of negative and positive values, thereby the output energy of the beam (Article 33(3) PCT).

Document D3 relates to medical (linear) accelerators wherein the problem of obtaining adequate portal images is addressed. However, in D3 this problem is not solved by using a variable coupling ratio or a comparable technique.

3. (Industrial applicability)

The subject-matter of claims 1 - 9 meets the requirement of Article 33(4) PCT.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



1 10000 000000 00 000000 00000 00 00 0000 0000 0000 0000 000000 000000 0000 0000

(43) International Publication Date
15 February 2001 (15.02.2001)

PCT

(10) International Publication Number
WO 01/11928 A1

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(22) International Filing Date: 3 August 2000 (03.08.2000)

(25) Filing Language: English

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(30) Priority Data:
9918787.4 10 August 1999 (10.08.1999) GB

(71) Applicant (for all designated States except US): ELEKTA AB (publ) [SE/SE]; P.O. Box 7593, S-103 93 Stockholm (SE).

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(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

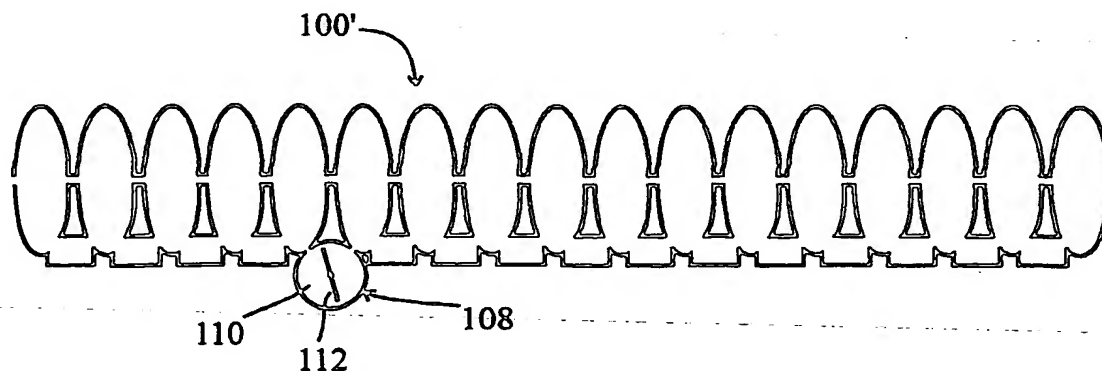
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LINEAR ACCELERATOR



(57) Abstract: An accelerator comprises a plurality of accelerating cells arranged to convey a beam, adjacent cells being linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, at least one coupling cell being switchable between a positive ratio and a negative ratio. Such an accelerator in effect inserts a phase change into the E field by imposing a negative ratio, meaning that the beam will meet a reversed electric field in subsequent cells and will in fact be decelerated. As a result, the beam can be developed and bunched in early cells while accelerating to and/or at relativistic energies, and then bled of energy in later cells to bring the beam energy down to (say) between 100 and 300 KeV. Energies of this magnitude are comparable to diagnostic X-rays, where much higher contrast of bony structures exists. Hence the accelerator can be used to take kilovoltage portal images. A suitable structure for the switchable coupling cell comprises a cavity containing a conductive element rotatable about an axis transverse to the beam axis, as for example set out in our earlier application PCT/GB99/00187. The application also relates to the use of such an accelerator and an operating method for such an accelerator.

LINEAR ACCELERATOR

FIELD OF THE INVENTION

The present invention relates to a linear accelerator.

BACKGROUND ART

In the use of radiotherapy to treat cancer and other ailments, a powerful beam of the appropriate radiation is directed at the area of the patient which is affected. This beam is apt to kill living cells in its path, hence its use against cancerous cells, and therefore it is highly desirable to ensure that the beam is correctly aimed. Failure to do so may result in the unnecessary destruction of healthy cells of the patient. Several methods are used to check this, and an important check is the use of a so-called "portal image". This is an image produced by placing a photographic plate or electronic imaging plate beneath the patient during a brief period of irradiation. The

beam is attenuated by the patient's internal organs and structures, leaving an image in the plate. This can then be checked either before complete treatment or after a dose, to ensure that the aim was correct.

Portal images are however extremely difficult to interpret. The energy of the beam which is necessary to have a useful therapeutic effect is very much greater than that used for medical imaging. At these higher energies there is smaller ratio in the relative attenuation between bony and tissue structure, which results in portal images with poor contrast. Structures within the patient are difficult to discern.

Some existing radiotherapy devices include a second radiation source which is adapted to produce a lower energy beam for producing a portal image. This second source is usually placed either alongside the principal accelerator and parallel thereto, or is mounted at an angle such that the entire unit is rotated about the patient to bring the second source into line for the portal image, following which the unit is rotated back for treatment. Both arrangements present difficulties in ensuring adequate alignment between the principal accelerator and the second source.

It has not hitherto been possible simply to reduce the energy of the principal (therapeutic) accelerator, since this must operate in a relativistic mode in order to maintain beam quality. If the final beam energy is too low, then the beam will be non-relativistic at earlier parts of the accelerator, preventing satisfactory operation.

SUMMARY OF THE INVENTION

The present invention therefore provides an accelerator comprising a plurality of accelerating cells arranged to convey a beam, adjacent cells being linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, at least one coupling cell being switchable between a positive ratio and a negative ratio.

Such an accelerator is eminently suitable for therapeutic use as part of a radiotherapy apparatus as a phase change is in effect inserted into the E field by imposing a negative ratio meaning that the beam will meet a reversed electric field in subsequent cells and will in fact be decelerated. As a result, the beam can be developed and bunched in early cells while accelerating to and/or at relativistic energies, and then bled of energy in later cells to bring the beam energy down to (say) between 100 and 300 KeV. Despite this low output energy, the beam is relativistic over substantially the same length of the accelerator, as previously. Energies of this magnitude are comparable to diagnostic X-rays, where much higher contrast of bony structures exists. Hence the accelerator can be used to take kilovoltage portal images.

It is preferred that the switchable coupling cell comprises a cavity containing a conductive element rotatable about an axis transverse to the beam axis. This is more preferably as set out in our earlier application PCT/GB99/00187, to which specific

reference is made and the contents of which are hereby incorporated by reference. Protection may be sought for features set out in this application in combination with features set out in that application.

The application likewise relates to the use of an accelerator in which a plurality of accelerating cells arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, wherein at least one coupling cell is switched between a positive ratio and a negative ratio.

Further, the application relates to an operating method for an accelerator in which a plurality of accelerating cells arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, wherein at least one coupling cell is switched between a positive ratio and a negative ratio.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described by way of example, with reference to the accompanying figures, in which;

Figure 1 is a schematic illustration of a conventional linear accelerator;

Figure 2 shows a desirable electric field in the accelerator of figure 1;

Figure 3 shows a typical electric field as "observed" by an electron being accelerated;

Figure 4 shows a linear accelerator according to the present invention;

Figure 5 shows the variations of the individual coupling coefficients between cell 108 of figure 4 and the two adjacent coupling cells, and shows the variation of the ration of these coefficients as the conductive element (the vane) is rotated;

Figures 5a and 5b proposes an explanation of figure 5;

Figure 6 shows an electric field seen by an electron for the accelerator of figure 4 with the rotatable element set to step down the E-field;

Figure 7 shows a similar electric field with the rotatable element set to step up the E-field; and

Figure 8 shows a still further electric field with the rotatable element set to reverse the E-field.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring to figure 1, a conventional accelerator 100 has a series of accelerating cells such as 102. These are arranged in a linear array and communicate via an aperture 104 on the centreline of each. An accelerating beam of electrons passes along that path through each accelerating cell. Coupling cells such as 106 are arranged between adjacent accelerating cells and provide a degree of rf coupling

between accelerating cells. This coupling regulates an rf standing wave which is established in the accelerator by an external means (not shown).

Conventionally, the cells are numbered starting at the first accelerating cell and sequentially for each cell of whatever type. Thus the first coupling cell, between the first and second accelerating cells, is cell 2. The second accelerating cell is then cell 3. This is illustrated in figure 1, and results in accelerating cells being odd-numbered and coupling cells being even-numbered.

Figure 2 shows the desired rf pattern in the cells. It should be remembered that the pattern is that of a standing wave illustrated at an instant in time, so the actual E field at a particular location oscillates between the maximum shown in figure 2 and the reverse field. The field is ideally positive in cell 1, zero in cell 2, negative in cell 3, and zero in cell 4. It then repeats this pattern of being zero in the coupling cells and alternating polarity in successive accelerating cells. The accelerator is sized in relation to the frequency of the rf standing wave such that in the time that the accelerating electron moves from one cell to another, for example from cell 23 to cell 25, the standing wave will have completed one half cycle. As a result, the E field in cell 25 will, when the electron arrives, be the opposite of its value when the electron was in cell 23. Thus, the E field will be positive, so far as the electron observes, in every accelerating cell and the electron will steadily gain energy from the E field as it progresses.

In the later accelerating cells, the energy of the electron is such as to render its movement relativistic. As it gains energy, therefore, its speed remains substantially constant despite its rising kinetic energy. This allows the phase relationship between the rf standing wave and the progressing electron to remain fixed. It is therefore important that the beam remains relativistic, since it will otherwise fall out of synchronisation with the rf standing wave. It is not therefore possible to reduce the output energy of the beam by reducing the acceleration (ie the rf power) since although the beam would in theory be relativistic when output, it would have been non-relativistic for a substantial length of the accelerator and the beam would therefore suffer loss of phase synchronism.

Figure 3 shows a plot of the likely actual E field as observed by the electron during its passage through the accelerator. It can be seen that there are a number of points corresponding to the centres of accelerating cavities where the E field is strong and positive. Between these areas the field is small and can be ignored. Within cells, the field approximates to that desired.

Figure 4 shows a linear accelerator according to the present invention. Cell 10 is replaced with a variable coupling cell 108 which comprises a substantially cylindrical cavity 110 aligned transverse to the axis of the accelerator in which is placed a rotateable vane 112. This is as described in our earlier application PCT/GB99/00187, to which the reader is referred. As described in that application, this arrangement

allows a wide range of ratios of coupling coefficients to be obtained. However, it is now further apparent that this arrangement can in fact generate a negative ratio, as shown in figure 5. This shows the coupling coefficients and the ratio between them as the vane is rotated through 360° . It will be seen in this figure that over some ranges of vane angle, both coupling coefficients have the same sign and hence the ratio between them is positive, but that over other ranges of vane angle the coupling coefficients have different signs and hence the ratio is negative.

It is this ability of the arrangement to produce coupling coefficients that can either be of the same sign or be of opposite signs that can permit two portions of a linear accelerator either to both provide acceleration of particles or for one portion to accelerate whilst simultaneously for the other to decelerate.

In some regions, the ratio is very large indeed and the accelerator may well be unstable in these regions. However, in other areas such as between 30° and 180° on the scale as illustrated, the ratio can be varied smoothly between a moderate positive and moderate negative value.

is predominantly magnetic with the axial H-field indicated by arrow ends (x and \circ) according to whether the field points into or out of the page).

Thus when the vane 112 is between ports 116, 118 (figure 5a) linking the accelerating and coupling cells, each port will see an H-field of the same polarity (e.g. both x), giving rise to a positive coupling coefficient ratio and electron acceleration both upstream and downstream of the coupling cell. In general, these accelerating field strengths will differ according to the exact angular setting of the vane.

When the vane 112 is transverse to the ports 116, 118 (figure 5b), the polarity of the H-fields seen by the ports will be opposite (eg x and \circ) giving rise to a negative coupling coefficient ratio and thus electron acceleration upstream and deceleration downstream of the coupling cell.

Figures 6 and 7 show the effect on the accelerating cell E fields of a coupling coefficient ratio greater than unity and less than unity respectively. In figure 6, after cell 10, the electric field experienced by the accelerating beam drops, and the beam will therefore gain less energy and the output energy will be less. In figure 7, after cell 10, the electric field experienced by the accelerating beam rises, and the beam will therefore gain more energy and the output energy will be greater. This illustrates the ability of the apparatus of PCT/GB99/00187 to vary the output energy of the beam.

Figure 8 shows the effect of a negative coupling coefficient ratio. The E field from cell 9 to cell 11 is reversed, effectively a phase change in the rf standing wave. Thus, from cell 11 onwards, the beam experiences an E field which acts to decelerate it, ie it loses energy to the E field. Thus, the beam output can be of a very low energy indeed. This enables a portal image to be taken with adequate contrast.

Attempts have previously been made to insert a phase change in the rf field by separating it from the beam and inserting an additional half wavelength path, but this raises severe difficulties in reuniting the rf and the beam. This arrangement avoids this difficulty entirely.

It will of course be apparent to those skilled in the art that many variations could be made to the above arrangements without departing from the scope of the present invention.

CLAIMS

1. An accelerator comprising a plurality of accelerating cells arranged to convey a beam, adjacent cells being linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, at least one coupling cell being switchable between a positive ratio and a negative ratio.
2. An accelerator according to claim 1 in which the beam is relativistic over substantially the length of the accelerator.
3. An accelerator according to claim 1 or claim 2 in which the switchable coupling cell comprises a cavity containing a conductive element rotatable about an axis transverse to the beam axis.
4. The use of an accelerator in which a plurality of accelerating cells are arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, wherein at least one coupling cell is switchable between a positive ratio and a negative ratio.
5. An operating method for an accelerator in which a plurality of accelerating cells

are arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, wherein at least one coupling cell is switched between a positive ratio and a negative ratio.

6. The use of an accelerator according to any one of claims 1 to 3 for taking kilovoltage portal images.
7. An accelerator substantially as described herein with reference to and/or as illustrated in the accompanying figures 4 to 8.

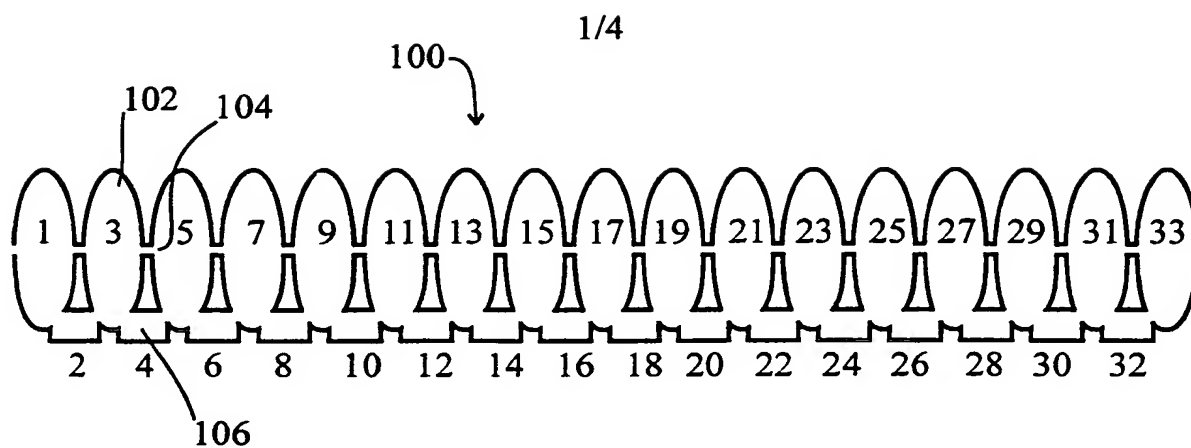


Fig 1

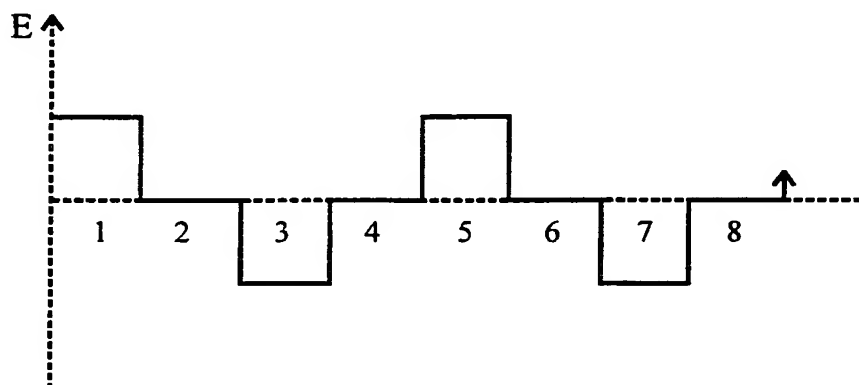


Fig 2

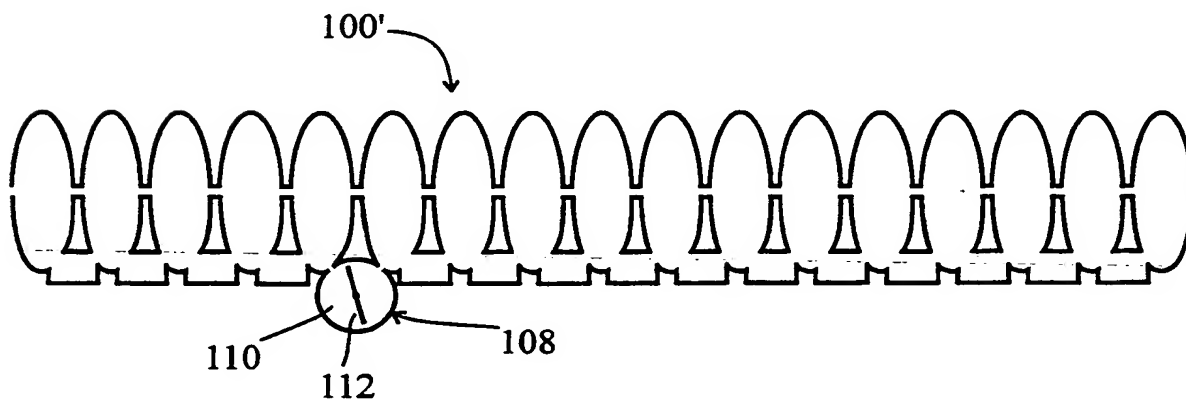


Fig 4

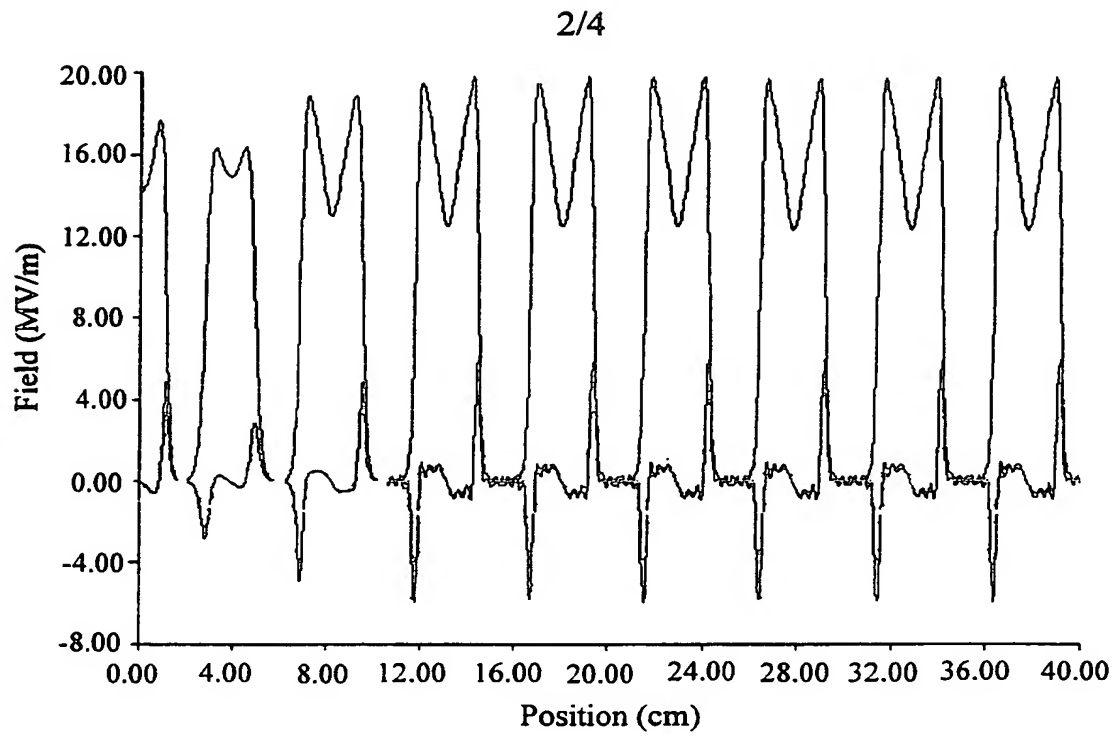


Fig 3

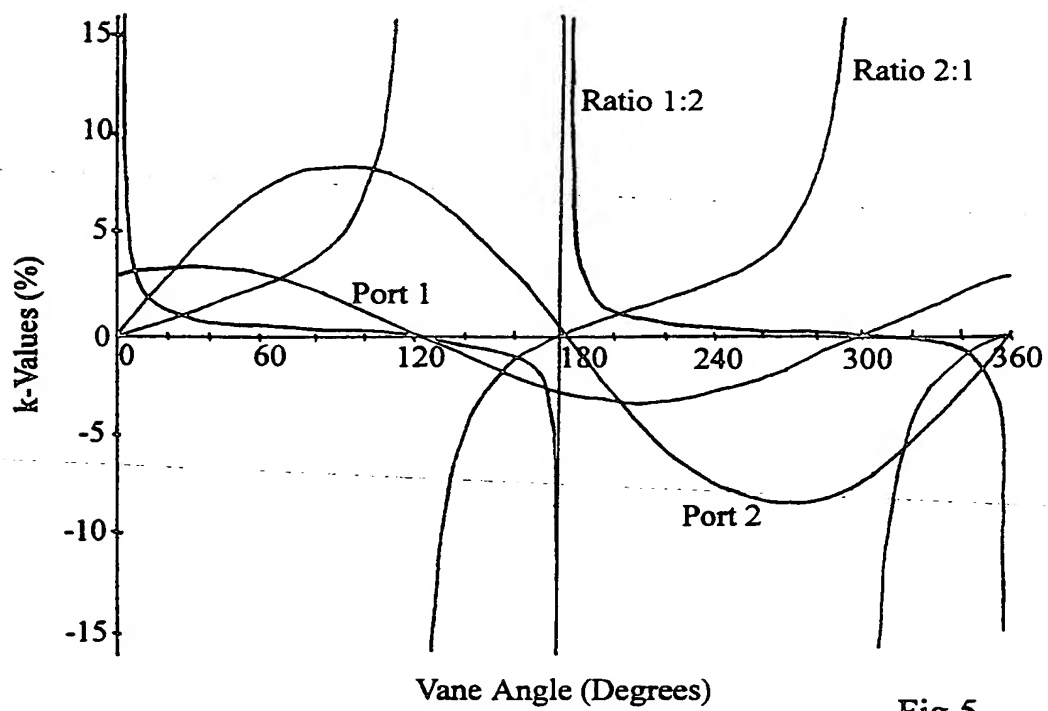


Fig 5

3/4

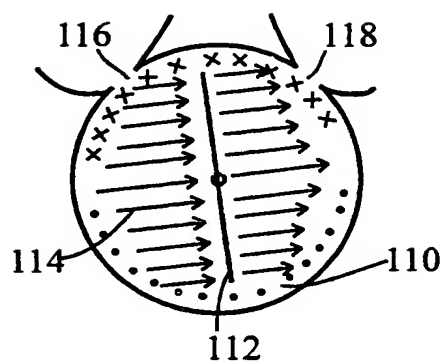


Fig 5a

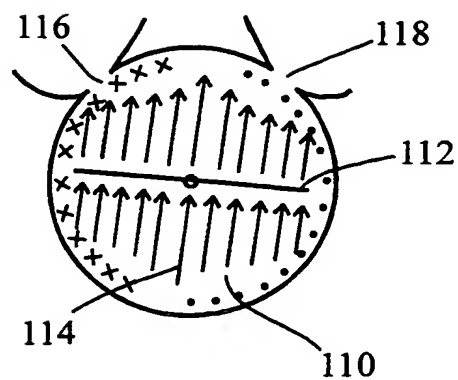


Fig 5b

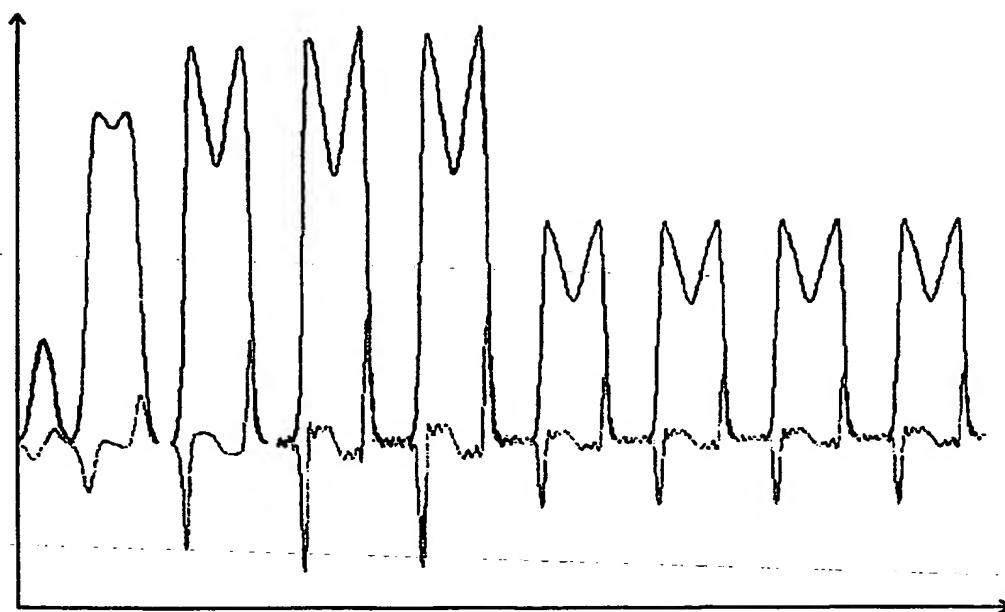


Fig 6

4/4

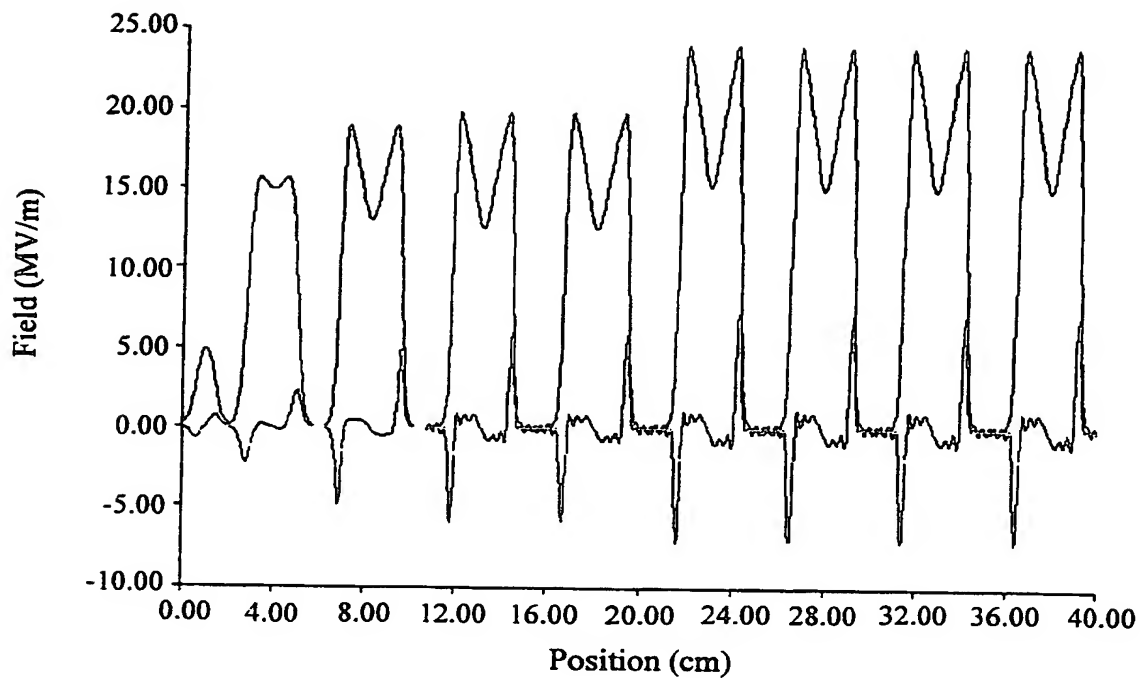


Fig 7

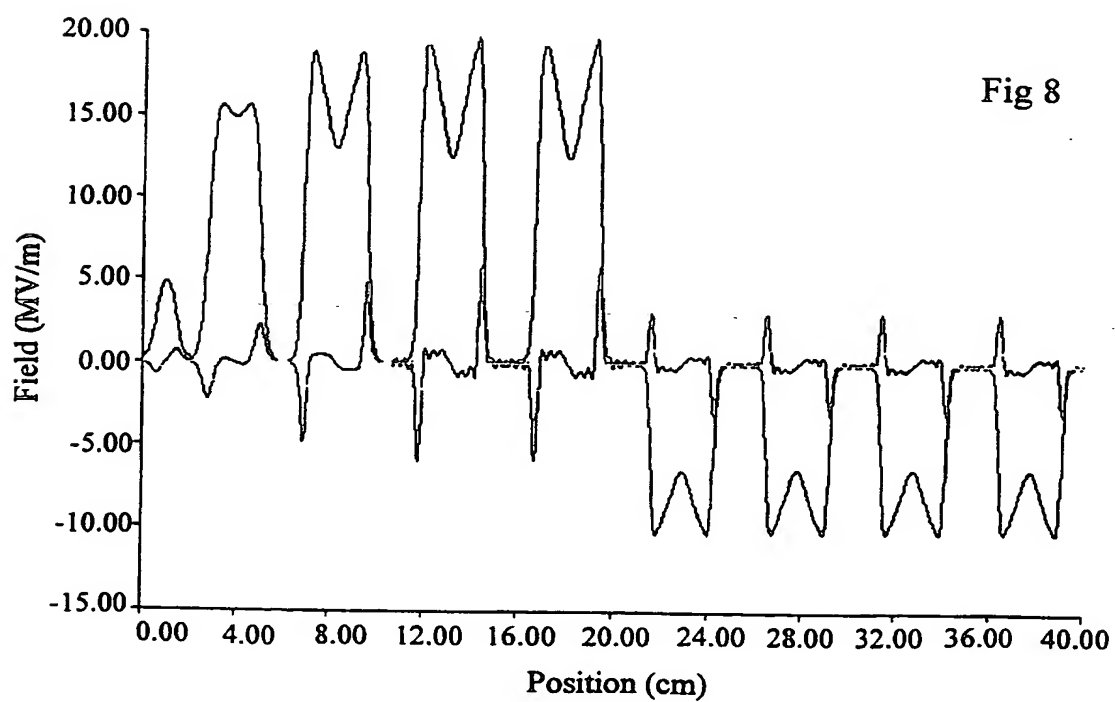


Fig 8

INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/GB 00/03004

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H05H7/18 H05H9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H05H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, INSPEC, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	TANABE E ET AL: "Compact multi-energy electron linear accelerators" NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH, SECTION - B: BEAM INTERACTIONS WITH MATERIALS AND ATOMS, NL, NORTH-HOLLAND PUBLISHING COMPANY. AMSTERDAM, vol. B10/11, no. PART 02, 1985, pages 871-876, XP002103628 ISSN: 0168-583X page 873, left-hand column, paragraph 2	1-5,7
P, Y	GB 2 334 139 A (ELEKTA AB) 11 August 1999 (1999-08-11) the whole document	1-5,7
	-/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

21 November 2000

Date of mailing of the international search report

27/11/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Capostagno, E

INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/GB 00/03004

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>JAFFRAY D A ET AL: "Dual-beam imaging for online verification of radiotherapy field placement"</p> <p>WORKSHOP ON THE IMPLEMENTATION OF THREE DIMENSIONAL CONFORMAL RADIOTHERAPY, BETHESDA, MD, USA, 21-22 APRIL 1994, vol. 33, no. 5, pages 1273-1280, XP000964941</p> <p>International Journal of Radiation Oncology Biology Physics, 1 Dec. 1995, Elsevier, UK</p> <p>ISSN: 0360-3016</p> <p>abstract</p> <p style="text-align: center;">-----</p>	6

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. Patent Application No

PCT/GB 00/03004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2334139 A	11-08-1999	WO 9940759 A	12-08-1999

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

DOWNING, Michael Philip
FRY HEATH & SPENCE
The Old College
53 High Street
Horley, Surrey RH6 7BN
GRANDE BRETAGNE

RECEIVED

31 DEC 2001

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 27.12.2001

Applicant's or agent's file reference

...

P577957

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/03004

International filing date (day/month/year)
03/08/2000

Priority date (day/month/year)
10/08/1999

Applicant

ELEKTA AB (publ) et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Wolinski, A



Tel. +49 89 2399-2292



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference ...	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/03004	International filing date (day/month/year) 03/08/2000	Priority date (day/month/year) 10/08/1999
International Patent Classification (IPC) or national classification and IPC H05H7/18		
Applicant ELEKTA AB (publ) et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 2 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input checked="" type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 27/12/2000	Date of completion of this report 27.12.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van den Berg, G Telephone No. +49 89 2399 2499 	

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03004

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-10 as originally filed

Claims, No.:

1-10 as received on 30/10/2001 with letter of 30/10/2001

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03004

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 10.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed:

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)

Yes: Claims 1 - 9

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03004

	No:	Claims	
Inventive step (IS)	Yes:	Claims	1 - 9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1 - 9
	No:	Claims	

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/03004

To point III:

Please see comments under point VIII

To point VI:

The claimed priority of the underlying international application is valid. Documents GB 2 334 139 and WO 99 40759 have not been taken into consideration for assessment of novelty and inventive step.

To point VIII:

The claims do not meet the requirements of Article 6 PCT:

1. The description mentions a variable ratio of coupling coefficients in certain areas (cf. page 7, last line - page 8, line 1; page 8, lines 14 - 17). However, apart from that the at least one coupling cell is defined as being "switchable" between a (single) positive ratio and a (single) negative ratio (cf. page 3, lines 2 - 7; page 4, lines 5 - 15; 1st and 2nd full paragraph) which may cause a discrepancy with respect to the wording claimed in claims 1, 5 and 7 including **plural** positive and negative ratios.
Furthermore, from the description it does not become how many coupling cells are involved providing a positive and a negative ratio (cf. page 9, lines 4 - 8: "coupling cells"), or if it is the **same** cavity providing a positive and a negative ratio as probably required by claim 1.

The observations under point V are made under the reservation of these possible discrepancies between claims and description.

2. The requirement of Rule 6.2(a) PCT is not met (claim 10).
3. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

To point V:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/03004

Reference is made to the following documents:

Nuclear Instruments & Methods in Physics Research, Section - B: Beam Interactions with Materials and Atoms., vol. B10/11, no. Part 02, 1985, pages 871 - 876 (D1)

Workshop on the Implementation of Three-dimensional Conformal Radiotherapy, Bethesda, MD, USA, 21 - 22 April 1994, vol. 033, no. 5, pages 1273 - 1280 (D3)

1. (Novelty)

Insofar as the subject-matter of claim 1 can be understood in view of point VIII.1, it is not anticipated by the disclosure of D1 because the coupling cell provides a plurality of ratio values. The subject-matter of claim 1 and thus that of claims 5 and 7 would meet the requirement of Article 33(2) PCT.

2. (Inventive step)

Insofar as claim 1 can be understood in view of point VIII.1, it is not rendered obvious by the disclosure of D1 because according to this document the coupling cell can only provide one single negative value such that there would be no incentive to continuously vary the ratio obtaining a plurality of negative and positive values, thereby the output energy of the beam (Article 33(3) PCT).

Document D3 relates to medical (linear) accelerators wherein the problem of obtaining adequate portal images is addressed. However, in D3 this problem is not solved by using a variable coupling ratio or a comparable technique.

3. (Industrial applicability)

The subject-matter of claims 1 - 9 meets the requirement of Article 33(4) PCT.

CLAIMS

[Amended - PCT Chapter II]

1. An accelerator comprising a plurality of accelerating cells arranged to convey a beam, adjacent cells being linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, at least one coupling cell being variable to allow a range of ratios including positive values and negative values.
2. An accelerator according to claim 1 in which the at least one coupling cell is variable smoothly from a positive value to a negative value.
3. An accelerator according to claim 1 or claim 2 in which the beam is relativistic over substantially the length of the accelerator.
4. An accelerator according to any one of the preceding claims in which the variable coupling cell comprises a cavity containing a conductive element rotatable about an axis transverse to the beam axis.
5. The use of an accelerator in which a plurality of accelerating cells are arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective

adjacent accelerating cells, at least one coupling cell being variable to allow a range of ratios including positive values and negative values.

6. Use according to claim 5 in which the at least one coupling cell is variable smoothly from a positive value to a negative value.
7. An operating method for an accelerator in which a plurality of accelerating cells are arranged to convey a beam, and adjacent cells are linked by a coupling cell, the coupling cells being arranged to dictate the ratio of electric field in the respective adjacent accelerating cells, at least one coupling cell being variable to allow a range of ratios including positive values and negative values.
8. The method of claim 7 in which the at least one coupling cell is variable smoothly from a positive value to a negative value.
9. The use of an accelerator according to any one of claims 1 to 4 for taking kilovoltage portal images.
10. An accelerator substantially as described herein with reference to and/or as illustrated in the accompanying figures 4 to 8.

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

DOWNING, Michael, Philip
Fry Heath & Spence
The Old College
53 High Street
Horley
Surrey RG6 7BN
ROYAUME-UNI

RECEIVED

11 OCT 2000

Date of mailing (day/month/year) 04 October 2000 (04.10.00)	
Applicant's or agent's file reference P57795D	IMPORTANT NOTIFICATION
International application No. PCT/GB00/03004	International filing date (day/month/year) 03 August 2000 (03.08.00)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 10 August 1999 (10.08.99)
Applicant ELEKTA AB (publ) et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
10 Augu 1999 (10.08.99)	9918787.4	GB	27 Sept 2000 (27.09.00)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

Lazar Joseph Panakal

Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

INFORMATION CONCERNING ELECTED OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

To:

DOWNING, Michael, Philip
Fry Heath & Spence
The Old College
53 High Street
Horley
Surrey RH6 7BN
ROYAUME-UNI

RECEIVED

123 APR 2001

Date of mailing (day/month/year) 11 April 2001 (11.04.01)		
Applicant's or agent's file reference P57795D		IMPORTANT INFORMATION
International application No. PCT/GB00/03004	International filing date (day/month/year) 03 August 2000 (03.08.00)	Priority date (day/month/year) 10 August 1999 (10.08.99)
Applicant ELEKTA AB (publ) et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

AP : GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW
EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : AU, BG, CA, CN, CZ, DE, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
National : AE, AG, AL, AM, AT, AZ, BA, BB, BR, BY, BZ, CH, CR, CU, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX, MZ, PT, SD, SG, SI, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

<p style="text-align: center;">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p>	<p>Authorized officer: S. Mafla</p> <p>Telephone No. (41-22) 338.83.38</p>
---	---

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

DOWNING, Michael, Philip
Fry Heath & Spence
The Old College
53 High Street
Horley
Surrey RH6 7BN
ROYAUME-UNI

RECEIVED

23 FEB 2001

Date of mailing (day/month/year) 15 February 2001 (15.02.01)		
Applicant's or agent's file reference P57795D		IMPORTANT NOTICE
International application No. PCT/GB00/03004	International filing date (day/month/year) 03 August 2000 (03.08.00)	Priority date (day/month/year) 10 August 1999 (10.08.99)
Applicant ELEKTA AB (publ) et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

AU,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE,AG,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,BZ,CA,CH,CN,CR,CU,CZ,DE,DK,DM,DZ,EA,EE,EP,ES,
FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,
MN,MW,MX,MZ,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
15 February 2001 (15.02.01) under No. WO 01/11928

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.